Regenerative Medicine: The Hype, the Hope, and the Future

Although the underlying concepts of tissue engineering and regenerative medicine go back more than 75 years, the term tissue engineering actually was only “coined” in the 1980s. This was followed by the 1990s being the “go-go” years with stem cells emerging as a technology, an industry developing, and the term regenerative medicine beginning to be used. There also was a lot of hype, and following the turn of the century the field entered what might be called the “sobering” years, with private sector activity falling significantly even though the science continued to advance. The last decade, however, has all the marks of being “back to the future.” Advances in cell-based therapies have been fueled by advances in stem cell science and technology and the discovery of what is required to reprogram somatic cells into stem cells, known as induced pluripotent stem (iPS) cells. For cellular therapies, a key question is what is the mechanism of action? For a specific therapy, is the mechanism one of cell replacement or is it a paracrine effect? If the latter, is it possible that one could introduce the appropriate biological signals without the use of cells? In this case the discussion shifts from “my cell is better than your cell” to “my biological signals are better than yours.” Whatever the case, one of the “holy grails” is the neurodegenerative diseases/disorders and the repair/regeneration of the central nervous system. Instead of the mixture of hype and hope in the past, and with an aging population providing the threat of a “tsunami” of neural disorders, regenerative medicine offers the real possibility of cures to these diseases/disorders in the future.